ENGINEERING LITERATURE

Supplement to ENGINEERING NEWS. 220 Broadway, New York, November 16, 1911.

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Extreme Examples of Methods of Instruction in Thermodynamics.

Reviewed by LIONEL S. MARKS,* M. Am. Soc. M. E.

PRACTICAL THERMODYNAMICS.—A treatise on the Theory and Design of Heat Engines, Refrigeration Machinery, and Other Power-Plant Apparatus. By Forrest E. Cardullo, M. E., M. Am. Soc. M. E.; Professor of Mechanical Engineering in the New Hampshire College of Agriculture and the Mechanic Arts. New York and London: McGraw-Hill Book Co. Cloth; 6 × 9½ ins.; pp. 411; 224 text figures. $3.50, net.

PRINCIPLES OF THERMODYNAMICS.—By G. A. Goodenough, M. E., Professor Thermodynamics in the University of Illinois. New York: Henry Holt & Co. Cloth; 6¼ × 9½ ins.; pp. 327; 123 text figures. $3.50, net.

There is probably no subject taught in the customary engineering curriculum which is more difficult of assimilation by the average American student than the science of thermodynamics. The students of Europe by reason of a severer mental discipline in the schools, and also, perhaps, on account of a more philosophic tendency of mind, are more capable of assimilating the subject when it is presented to them in its natural shape. For the consumption of American students it seems to many instructors to be necessary either to predigest the subject to a considerable extent before it is offered to the student, or else to introduce it into his system by a kind of subcutaneous injection with the use of local anesthetics.

There can be no doubt that the direct and formal method of presenting the subject is the better so long as it actually succeeds in giving the student a tool for the solution of the usual problems arising in ordinary practice, for it has the advantage over the less direct methods of instruction of considerable disciplinary value, and also of giving a better foundation for the solution of new problems. The objection to it, however, is that only too frequently the student fails to profit by it to a degree sufficient to permit him to make use of it for the solution of practical problems, while the less direct method, concentrating its attention mainly on the practical problems, can more readily assure a grasp of the means of their solution.

The two books under review represent rather extreme examples of the two methods of instruction. Professor Goodenough explains that his purpose is "to provide a course in the principles of thermodynamics that may serve as an adequate foundation for the advanced study of heat engines" and he has fulfilled his purpose excellently. The treatment is by direct mathematical analysis of a sufficiently rigorous nature, is well arranged, clear and complete. A teacher who succeeds in giving a working knowledge of thermodynamics to his students by this text can be satisfied that he has given them an excellent foundation for heat-engine investigation.

Professor Cardullo "attempts to present the subject of thermodynamics from the physical rather than from the mathematical standpoint." And further, "a minimum of higher mathematics is used and the methods employed are those which appeal to common sense rather than to a knowledge of the calculus." The treatment is of the less direct type, that is, the development of the subject is not by deduction from the general equations of thermodynamics but rather by the deduction of special equations for the separate phenomena considered. It is probable that this method of attack is better suited to the needs and the mental development of the majority of engineering students than the more logical process.

There are a number of points worthy of special mention in both works. Goodenough has followed in general the development in Bryan's Thermodynamics. The second law is made identical with the law of degradation of energy, the connection between irreversibility and loss of availability is pointed out, and by means of the Carnot cycle a measure of availability is obtained. Entropy is then defined in terms of unavailable energy, and from this fundamental definition the usual definition of the entropy of a non-isolated system is easily derived. The author believes that this method of presentation gives a definite conception of the meaning and scope of the second law and removes the difficulties that usually surround the definition of entropy.

In marked contrast is the treatment of the second law and of entropy in Cardullo's book. Entropy is introduced in the following way: "It is convenient in the development of proofs from many thermodynamic theorems, and in working out certain classes of problems, to make use of a ratio or abstract quantity to which the term *entropy* has been applied." The quantity is then defined and a number of propositions are established giving the properties of this quantity. Then follows the statement: "A recognition of these facts is so fundamental to the science of thermodynamics that some form of statement of them is usually called the second law of thermodynamics, the so-called first law of thermodynamics being a statement of the interrelation of heat and other forms of energy." This is the only reference that the reviewer has found to the two laws—a sufficient indication of the unconventional nature of the development of the subject.

The treatment of the properties of saturated and superheated steam in Goodenough's book has a number of points of special interest. Not only is the treatment thoroughly up to date in that it includes the results of the most recent investigations, but also it includes many useful empirical equations deduced by the author from those results. A new approximate equation (similar in form to the old Zeuner equation) is given for the adiabatic expansion of saturated steam, with a range of application up to 240 lbs. absolute pressure and down to a quality of 0.5. Similarly, a new equation is deduced giving the relation between the pressure and specific volume of dry and saturated steam. A new expression for the specific heat at constant pressure of superheated steam gives results agreeing very closely with the experimental values of Knoblauch & Jakob, and is, moreover, integrable so as to permit of the calculation of mean specific heats. A simple equation for the adiabatic expansion of superheated steam gives results which the author regards as satisfactory for practical purposes. Other noteworthy parts of the book are the treatment of mixtures of gases and vapors and of the properties of gaseous mixtures with variable specific heats. Throughout the text there are interspersed solved problems which will prove of the greatest value to the student and each chapter concludes with a well selected set of exercises. For the benefit of the more advanced student, very complete references are given to other works for each topic dealt with. The references to Ennis are misspelled Innes throughout the book. Professor Goodenough has written a book of real value to the earnest student. We shall look forward with interest to his second volume dealing with the design, operation and performance of heat engines.

Cardullo's book devotes a considerable amount of space to the description of actual engines and their details. The chapters on the construction of steam engines, the descriptions of furnaces, of boilers, and other steam appliances; the chapters on gaseous fuels, on refrigeration, and on heating and ventilation, contain many matters which are not customarily included in books on thermodynamics but which add to the value of a book which is designed to give instruction in the general technical applications of heat. The inclusion of such matters and the absence of a formal treatment of thermodynamics gives an impression of lack of unity. This impression is further heightened by the addition in small type throughout the text of matters of a more advanced nature. The sequence of chapters is, however, well arranged and the book really resolves itself into a series of articles on different topics without very close interrelation. The individual chapters, after the first seven chapters which are devoted to the "fundamental physical principles," treat respectively of the steam engine, steam cycles, losses in the steam engine, notes on the design and testing of steam engines, the steam turbine, condensing machinery, combustion, the steam boiler, boiler plant auxiliaries, water cooling apparatus, hot-air engines, the internal combustion motor, notes on the design and performance of internal combustion engines, gaseous fuels, compressed air, refrigeration, heating, ventilation, evaporation and drying, entropy diagrams, and the kinetic theory of gases. The subjects are all handled clearly and give a very readable introduction to and general survey of the field under discussion, with sufficient mathematical treatment to permit of some general calculations. Each chapter ends with a considerable number of well selected problems. The book is well gaged to meet the requirements of a large proportion of the technical schools.

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The fourth volume of the "Canal Record," published by the Isthmian Canal Commission, has recently been received. This volume covers the period Aug. 31, 1910, to Aug. 23, 1911. It contains 416 pages, 9 × 11½ ins., of information on all phases of the Panama Canal work. Probably few engineers in the States realize the wealth of engineering data contained in the four bound volumes of the weekly "Canal Record." Besides furnishing an official contemporary history of this great undertaking, these books will prove valuable for reference on methods and costs of a great variety of engineering operations. Each volume is provided with a well-made index, so that all data on a certain piece of work may be easily and quickly found. Inquiries regarding the "Canal Record" should be addressed to the Isthmian Canal Commission, Ancon, C. Z., Panama.

Water-Supply and Sewerage From German Viewpoints.

Reviewed by EMIL KUICHLING,* M. Am. Soc. C. E.

WASSER UND ABWASSER (Water and Sewage). —Being Part II. of Vol. II. of "Handbuch der Hygiene." Edited by Profs. M. Rubner, M. v. Gruber and M. Ficker; written by Drs. O. Spitta, A. Schmidtmann, K. Thumm, C. Reichle and R. Kolkwitz. Leipzig: S. Hirzel. Paper; 7 x 10 ins.; pp. 410; 3 colored plates and 111 text illustrations. Marks 15, American price, $6, net.

This handsome volume is part of the extensive "Manual of Hygiene" now being edited by Professors Rubner, v. Gruber and Ficker. On account of the general importance of the subjects, as well as the thoroughness with which they have been treated by the several authors in the light of the most recent advances that have been made in the arts of water-supply and sewerage, this volume has been published separately and prior to the appearance of the other parts of the Manual.

The volume is divided into three principal sections, as follows: Water-Supply, by Dr. O. Spitta; Sewerage and the Disposal of Sewage and Sludge, by Dr. A. Schmidtmann, Dr. K. Thumm and Ingr. E. Reichle; the Biology of Potable Water, Sewage and Outfalls, by Dr. R. Kolkwitz. Each of these authors has done much in past years in the way of special researches relating to water-supply, sewage disposal and the pollution of streams, and has acquired an enviable reputation for scholarly scientific work; hence the volume can be regarded as representing the best views of contemporary German science on the subjects treated. From their association with an encyclopedic and authoritative work on Hygiene, the sanitary considerations of the subjects predominate over the technical or constructional details, and for this reason the book has a special value in supplementing various more extensive treatises written for the use of engineers alone. Every chapter, however, recognizes the importance of practical experience by numerous references to other publications. Much attention has also been given to the history of the subjects, thereby adding greatly to their interest.

The first three chapters of the section on Water-Supply describe concisely the various natural sources and properties of water, as well as the particular qualities it should possess to serve for drinking purposes, and the quantity that should be provided. In regard to the latter, the usual European estimates of daily per capita consumption are given, ranging from 8 to 60 gals., and a strong contrast is drawn between the average daily supply of 55 gals. in London in 1904 and 31.5 gals. in Berlin in 1905, with that of 135 gals. in New York, 192 gals. in Chicago and 236 gals. in Philadelphia. The cause of a high water consumption in a large city is ascribed to three principal factors: the presence of industries which require much water, the existence of a sewerage system, and the absence of water meters. In most European cities, the greater portion of the water required for industrial uses is derived from independent sources, and this fact, along with the general use of meters, explains their relatively low per capita consumption from the public supply.

The fourth chapter deals with the various injuries to the public health that may be caused by impure water, and the sixth chapter is devoted to the improvement and purification of public water-supplies. The various systems of filtration are well described and their efficiencies discussed. Considerable space is also given to the removal or reduction of different kinds of matter held in solution in the water, such as coloring matters, lime, magnesia, manganese and iron. The seventh chapter deals briefly with the various methods of disinfecting or sterilizing water-supplies; but as this subject is still in experimental stages, a list of 67 references to discussions in numerous publications is given.

The remaining five chapters of this section relate to the distribution of water in cities, the water-supply of vessels, railway trains, camps, etc.; the examination of water by chemical and biological methods, the interpretation of the results of such examinations, and the various means of protecting public water-supplies from contamination.

The second section, entitled Sewerage and Sewage Disposal, is divided into 15 chapters, embracing 181 pages. After a good historical exposition of the subject, the composition of sewage is given, along with estimates of the quantities of various matters in solution and suspension under different conditions. The most important methods of examining crude and clarified sewage and industrial wastes are then described, and in the third and fourth chapters the fundamental principles of house drainage and municipal sewerage are set forth. In the fifth chapter the character of the outfall, or ultimate recipient of the sewage, and the requisite degree of purification of the sewage are well discussed, mainly with reference to fresh water streams; little is said about the discharge of sewage into tidal estuaries and the sea.

The sixth and seventh chapters give excellent descriptions of various devices for screening and sedimenting sewage, and the next three chapters are devoted to septic tanks, chemical precipitation, and artificial biological purification (contact beds and sprinkling filters) respectively. The eleventh chapter deals with the treatment of sewage on land, or intermittent filtration, irrigation and sewage farming. Special attention is given to the hygienic control of all these methods of purification, and the difficulties attending each process are well set forth.

In the thirteenth chapter a variety of industrial wastes and their relation to domestic sewage are discussed. In some cases a partial purification is recommended before admitting the liquid into the public sewers. The fourteenth chapter treats of the examination, disposal and utilization of the sludge resulting from the sedimentation or precipitation of the suspended matter in sewage. It is of great interest, as it refers to all the newest and most satisfactory developments in this extremely difficult problem. The last chapter of this section describes the methods of disinfecting sewage, effluents from tanks and sludge.

The third section deals with the biology of water, sewage and the outfalls into which sewage is discharged. It is written by a distinguished specialist, and forms an exceedingly valuable addition to the other two sections by presenting compactly the results of the latest studies on the action of aquatic plant and animal life on putrescible organic matters. This field is comparatively new, and scientific information pertaining to it has hitherto been scattered in a variety of foreign publications which are not usually found in our libraries. By the study of the various plants and animals contained in the water and on the bottom, the author believes that it is possible to arrive at a sound opinion concerning the purity or pollution of a water-supply more quickly and reliably than by chemical and bacteriological analyses.

This section is divided into three chapters, of which the first deals with the biology of drinking water, the second with that of sewage and its outfalls, and the third with the methods of examination and the various organisms. In the first chapter, springs, ground-water, wells, reservoirs, lakes, rivers and filters are considered. The second chapter takes up the biology of sewage, sewage farms, contact beds, and percolating filters; also industrial and mining wastes, and the self-purification of streams. The latter subject is handled in a masterly and highly interesting manner. The results of discharging sewage into great lakes and the sea are, however, discussed much too briefly. In the third chapter the methods of examining waters are described, and a list is given of the organisms which inhabit the zones of polluted, partly clean and purified water, respectively. Many of the typical organisms are represented in the appended three plates.

Probably the text of the volume is sufficiently extensive for a Manual of Hygiene, but the subject matter is much more condensed than is desirable for the use of a sanitary engineer. Some compensation for this brevity, however, is made by copious bibliographical r[illegible]ces. It is to be hoped that the several [illegible]ors will recognize this shortcoming by s[illegible]providing their readers with more exhaustive [illegible]atises on the three principal topics of the v[illegible]e. Notwithstanding its relative brevity, t[illegible]work has been done remarkably well by the [illegible]ors, and the volume will soon become a v[illegible]valuable book of reference.

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Mosquito Reduction Along the Suez Canal.

THE REDUCTION OF DOMESTIC M[illegible]UITOES. —Instructions for the Use of M[illegible]palities, Town Councils, Health Officers, [illegible]tary Inspectors, and Residents in Wa[illegible]Climates. By Edward Halford Ross, Liverp[illegible]School of Tropical Medicine; Late Health [illegible]er, Port Said and Suez Canal District; Aut[illegible]of "The Prevention of Fever on the S[illegible]Canal." Philadelphia, Pa.; P. Blackiston's [illegible]n & Co. Cloth; 6 x 9 ins.; pp. 114; many [illegible]strations. $1.75, post paid.

The use of the word "Reduction" [illegible]her than Extermination in the title of this vo[illegible]e is significant. The author does not claim that mosquitoes can be exterminated, but he does insist that they may be so reduced in numbers as to make life bearable. He also claims that this is legitimate municipal work, even where the mosquitoes are chiefly of the kinds which do not convey malaria, yellow fever and less common diseases.

In judging the possible usefulness of the book it should be remembered that it is designed for the guidance of officials and citizens in "warm climates." It may be added that so far as personal experience is concerned the book is based upon the work and observations of the author along the Suez Canal in general and at Port Said in particular. References to the work of others elsewhere, and a limited amount of information on some of the broad aspects of the mosquito problem are given, but the chief value of the volume seems to lie in the fact that it consists of leaves from the personal note book of the author. (For a recent world-wide survey of the mosquito-reduction field reference may be made to "Mosquito or Man," by Sir Robert Boyce, reviewed in this Supplement for April 14, 1910.)

Bearing in mind the limitations just mentioned it may be noted that after several brief introductory chapters the author blocks out a mosquito-reduction campaign for a city like Port Said, where fever due to mosquitoes prevails. The first step suggested is a fever census. The next steps are estimates of the cost of mosquito reduction, securing appropriations, organizing numerous mosquito brigades, the beginning and continuance of weekly house-to-house inspections, accompanied by the oiling of such breeding places as cannot be eliminated.

It should be understood that mosquito reduction as here presented is not a campaign of a few weeks or months, but a never-ending fight against a foe which can be kept in subjection but never eliminated. In view of this fact, it is interesting to note that the author puts the estimated cost of mosquito reduction in a city like Port Said at sixpence (12 cts.) per capita per year. Obviously this means little for a community where other local conditions prevail, such as housing, climate, topography, character of population, and wages and efficiency of labor. At the same time it suggests that perhaps some mosquito-infected districts of America might find mosquito-reduction work not at all beyond their financial resources, provided it was done persistently and consistently.

The large open type and few pages of the volume, combined with the personal and human factors which enter into its make-up, all go to make the volume readable, even if some might find fault with its lack of scientific completeness and somewhat rambling character. The relatively small size of the book does not excuse the lack of an index.

A quarterly publication entitled "The Human Factor" made its first appearance in September, 1911. It is published by the Department of Conservation of the Equitable Life Assurance Society (120 Broadway, New York City). One of its features is a health section conducted by Dr. F. C. Wells, Senior Medical Director of the Society.

British Sewage Disposal Practice and Opinions.

MODERN METHODS OF SEWAGE PURIFICATION. A Guide for the Designing and Maintenance of Sewage Purification Works. By C. Bertram Kershaw, Consulting Engineer. For twelve years Engineer to the Royal Commission on Sewage Disposal; F. R. San. Inst., F. R. Meteorological Soc., F. Geological Soc., etc. London: Charles Griffin & Co., Ltd. Philadelphia, Pa.: J. B. Lippincott Co. Cloth; 6 x 9 ins.; pp. 356; 36 plates, 13 text figures and 12 tables. $7.50, net.

For a considerable period British engineers left the writing of books on sewage treatment almost wholly to chemists, bacteriologists and medical officers of health. Recently several engineers have taken up the task. The latest of these is Mr. Kershaw, with both his general engineering knowledge of sewage disposal and his special intimacy with many phases of the subject derived during the twelve years in which he served as Engineer of the Royal Commission on Sewage Disposal. This unique experience has enabled Mr. Kershaw to write a volume which for some years to come will hold a unique position in the literature of sewage disposal; a volume which presents a general survey of the more strictly engineering phases of sewage disposal in Great Britain, based largely, but by no means wholly, on the many reports of the Commission named. As these reports, with their appendixes, are many, bulky and costly, a digest of their engineering data and conclusions is welcome; doubly so when made by the long-time engineer of the Commission.

A book framed on the plan of this one has its limitations, especially when an author confines himself so largely as has Mr. Kershaw to the practice of a single country, as exemplified by the data gathered by a single commission. Bearing these limitations in mind the book deserves a hearty welcome.

Very appropriately, in view of the large space given to the present Royal Commission on Sewage Disposal, the book opens with a chronological survey of British legislation on sewage disposal and of the long series of reports of earlier commissions on sewage disposal and stream pollution. This ground has been traversed more than once before, but it is advantageous to have it gone over again in the light of recent data, and particularly to give a historical perspective to a volume which itself deals so largely with the work of the present Commission (appointed in 1898).

The historical survey completed, the author feels compelled to take up "Conservency Methods." Mr. Kershaw gets away from this subject quicker than have most of his countrymen, and hurries on to a consideration of factors which affect the volume and character of sewage, the choice of a method of disposal and the layout of plant. The five chapters devoted to these topics take up population and water supplies; sewage collecting systems, both separate and combined; rainfall, runoff to sewers, and variations in sewage flow; the composition of sewage, and sites for disposal works.

Having devoted 110 pages to the topics thus far named, 245 pages remain for Modern Methods of Sewage Purification—the real subject of the book.

Naturally, the author begins here with Preliminary Processes. In these he includes screening, grit chambers, plain sedimentation, chemical precipitation and septic tanks. This chapter of 28 pages is followed by one of 43 on Disposal of Sludge, which may serve as a reminder that the sludge problem is still with us.

The Land Treatment of Sewage is given 40 pages, against 27 given to Contact Beds, and 31 to Percolating Filters. From the American viewpoint it is surprising that so much more space should be given to land treatment than to either contact beds or percolating filters and almost as remarkable that chemical precipitation is still regarded with so much favor in England. It is well to remember that for decades England was taught that application to land was the only safe final method of sewage treatment and until rescued by the present Royal Commission it was bound hand and foot to the use of land quite regardless of whether any land fit to receive sewage was available. It should also be remembered that under such a bondage chemical precipitation was often a necessity, until the advent of the septic tank. Furthermore, the septic tank has not been such a universal and unqualified success, regardless of local conditions, as to supplant chemical precipitation, even in new installations. For British readers the space given to land treatment, much less that devoted to chemical precipitation, cannot be regarded as disproportionate, unless it be by the most devoted believers in the septic tank, the contact bed and the percolating filter. For the American reader much of what is said about land disposal will have little practical value at the present time, but it is by no means certain that it will not be useful to some before many years, particularly in sections deficient in rainfall. It is to be noted, moreover, that land treatment is made by Mr. Kershaw to cover gradations running all the way from occasional uncropped farming areas to out-and-out intermittent filtration areas, although no such importance is accorded to intermittent filtration as has been given it in our own Massachusetts.

The limitations of the volume at some points are strikingly illustrated by the fact that the highly important subject of trade wastes is dismissed with a scanty seven pages, and that the disinfection of sewage is only one of a half score of topics in the nine-page chapter headed "Miscellaneous."

Save for a helpful detailed index the book closes with 39 pages of descriptions of nine different works in operation. These are all small or relatively small, but nevertheless interesting plants, more or less typical of the British practice of to-day. The descriptions are concise and are accompanied by statistics of operating results.

The illustrations comprising many of the large folding plates might have been presented in smaller compass, with no loss of reinforcement to the text and with great gain in convenience. The absence of illustrations drawn from manufacturers' catalogs and of wearisome and undiscriminating descriptions of one piece after another of proprietory apparatus, afford a pleasing contrast to some of the British books on sewage treatment.

Perhaps it has already been made quite clear that the book is essentially confined to British practice, and based largely on the reports of the Royal Commission on Sewage Disposal. This is carried so far that, although paying a handsome compliment to the work of the Massachusetts State Board of Health, the author contents himself with the compliment and with the advice that the reports (beginning in 1890 and continued yearly since then) "be read in extenso"—thus lightly setting a task of no small magnitude.

That the Germans have contributed in the slightest degree to the art and science of sewage treatment the author does not even hint, except by naming one or two German tanks quite categorically. Even the Travis hydrolytic tank (an out-and-out British adaptation of the septic tank, which grew more or less directly from a study of the Massachusetts reports) is dismissed with a reference to the Proceedings of the Institution of Civil Engineers; while in mentioning the "Emscher tank" (no credit to Imhoff) there is not the slightest suggestion of its relation to the Travis and the septic tanks. But this marked insularity of British authors of technical works is not new and Mr. Kershaw's book is so intimately and so largely related to his work as Engineer of the Royal Commission on Sewage Disposal that we can excuse him for almost forgetting that a sewage problem and men engaged in its solution exist or ever did exist outside his small island.

Finally, no one who makes any pretense of keeping posted on sewage treatment and who can afford the modest sum asked for this volume should fail to get hold of a copy of it, even though he possesses the thousands of pages comprising the reports of the Royal Commission and all the other books on sewage disposal; for Mr. Kershaw not only gives the gist and much of the substance of the engineering data of the reports of the Commission, but he has grouped much scattered information in logical order, combined it with facts from other sources, and interpreted and illumined the whole out of the breadths and depths of his own observation, experience and reflection.

Sewage Pollution and Typhoid Fever.

SEWAGE POLLUTION OF INTERSTATE AND INTERNATIONAL WATERS, With Special Reference to the Spread of Typhoid Fever. I. Lake Erie and The Niagara River. By Allen J. McLaughlin [Passed Assistant Surgeon, Division of Pathology and Bacteriology]. Hygienic Laboratory-Bulletin No. 77. (Public Health and Marine-Hospital Service of the U. S.). Washington, D. C.: Pub. Doc. Paper; 6 x 9 ins.; pp. 169.

Presumably, this is the first of a series of bulletins designed to cover all of the Great Lakes, but there is nothing to indicate this, further than the wording of the title and the use of the Roman numeral, I., before the sub-title.

After a general discussion of sewage-polluted water-supplies and typhoid death rates, accompanied by diagrams showing the fall of typhoid fever death rates after the introduction of pure water-supplies, there follows a general discussion of Lake Erie's source of water-supply. The author then takes up in succession the New York, the Pennsylvania and the Ohio shores of Lake Erie, and reviews the sources of pollution in their relations to the water-supplies of the various cities along these shores. These reviews are accompanied by local maps and typhoid diagrams. In a number of instances other sources of typhoid infection than public water-supplies are reviewed.

On page 25 of the introductory portion of the bulletin, there is an interesting and suggestive tabular classification of typhoid fever death rates per 100,000 population in four main classes of water-supply, ranging from Safe to Grossly Polluted on the main basis of classification. Each of these classes is again sub-divided into Excellent, Good, Fair and Bad, according to "other sanitary, economic and social factors bearing upon the prophylaxis of typhoid." A Safe water-supply with the other factors affecting typhoid falling under Excellent is rated with a probable typhoid rate of five or less per 100,000. A Safe water-supply, with other conditions good, would fall under the five to ten per 100,000 typhoid rate, and so on, until water-supplies subject to gross constant pollution are reached, when a typhoid rate above 50 or even 100 for a period of years might be expected.

A correspondent has called our attention to the decidedly offhand manner in which the author has decided, as if for good and all, some troublesome points about lake currents which have bothered engineers for years.

On the whole, the author's general ideas seem to be sane, but he might have laid even more emphasis that he does upon the importance of water filtration. In fact, this subject is of much greater importance to the cities on the Great Lakes than is sewage disposal.

Curiously enough, the three states whose shore lines are covered by this survey are notable for the efficiency of their state departments of health.

Most of the data presented appear to have been drawn from far more comprehensive sanitary surveys made by those departments or by the cities directly concerned. The problems involved are chiefly local, or at most state, rather than national or international in character, and their solution rests with engineers rather than medical men. Why, then, should the national government take up this subject at all, and if it does undertake it why does it not refer it to the best engineering talent the country affords and make the inquiry really national in character, instead of a compilation of existing local data?

We do not wish to discredit the evidently careful work and generally sane opinions of the author of this bulletin, but rather to call attention to the way the subject should be taken up if it is to be gone into by the federal government.

The chief justification for the bulletin as it stands is that it brings together and condenses

scattered and relatively bulky existing information. We are informed that the bulletin has also stimulated a number of local authorities to take action looking to a betterment of their sanitary conditions. This is good, but one must insist again that the bulletin scarcely touches the really significant interstate and international questions involved in the discharge of sewage into the Great Lakes.

Battleship Construction, Chiefly as Practiced at the Royal Dockyards, England.

Reviewed by D. W. TAYLOR.*

SHIPYARD PRACTICE AS APPLIED TO WARSHIP CONSTRUCTION.—By Neil J. McDermaid, Mem. Royal Corps of Naval Constructors; Late Instructor on Practical Shipbuilding at the Royal Naval College, Devonport. London, New York, Bombay and Calcutta: Longmans, Green & Co. Cloth; 6 × 9¼ ins.; pp. 328; many diagrams in text. $4, net.

This work, as indicated by the preface, is a development from the author's lectures upon naval construction to cadets at the Royal Naval College, Devonport, England. It contains 328 pages of text and illustrations, the latter being incorporated with the text and occupying about 50% of the volume.

The book opens with a description of the building slip and the work done preliminary to the laying of the keel of a ship. The methods of working, erecting and connecting the principal portions of the hull, such as keel, frames, inner and outer bottom, bulkheads, stem and stern post, deck beams and plating occupy the first 70 pages. We then have a brief description of methods used in building and erecting miscellaneous fittings, such as the shaft brackets, rudders, engine and boiler seatings, barbettes and hatches, about 20 pages being devoted to these subjects.

After ten pages of description of launching arrangements and launching and five or six pages upon rivet work, rivets and water testing, the author, on page 107, begins to deal with what can perhaps be best classed as hull fittings, etc. He describes water-tight doors and manholes, fittings in connection with heating and ventilating, magazine cooling, pumping, flooding and draining, various types of valves used for various purposes, fresh and salt-water service, sanitary arrangements, mess and sleeping accommodations, hatches and skylights and ladders, fittings for torpedo net defense, coaling ship arrangements, masts, boat handling gear, steering gear with the exception of the engine, anchor and cable arrangements, etc. The preceding subjects occupy about 100 pages in all and after a brief treatment of wooden sheathing and calking and a few minor subjects, we find, beginning on page 218, about 40 pages devoted to laying off and mold loft practice as applied to various parts of the ship. The construction and use of the half block model is described, methods of laying off longitudinal, of making molds for water-tight and oil-tight frames and for side armor, methods of laying off shaft swells, bilge keels, etc. Methods of getting out a few important patterns are then given, such as the patterns of stem castings and shaft brackets.

Next we find a brief treatment of launching curves, followed by information about draft marks, inclining experiments, and turning trials. Some information is then given about methods of testing and the test requirements of various fittings, after which, beginning on page 280, there are several pages devoted to the question of docking and allied subjects.

Beginning on page 289 there are seven pages devoted to descriptions of pneumatic hand tools of several makes. We then find a few pages devoted to the subjects of spar making and boat building, the book proper ending on page 321 with a table of the test requirements for the various materials. A two-page appendix, amplifying what is said in the body of the book about launching, is followed by a three-page index.

The book is not divided into chapters and, as might be inferred from the summary of its contents, the subjects are of rather a heterogeneous character and the arrangement appears to be far from systematic.

In addition to the information given as to shipyard practice a large portion of the book consists of information as to the various fittings and appliances used on British vessels of war. This is natural under the circumstances and the information given is valuable, but covers a restricted field. It is noticeable throughout that the author confines himself entirely to the specific methods of the English Royal Dock Yards.

For instance, on pages two and six, dealing with appliances used about building slips, the author indicates fixed derricks only for dealing with material to be hoisted on board. This is the practice in the English dockyards, but in many English private yards, and in practically all German and American shipyards, the old-fashioned derrick has been long ago superseded by traveling cranes of various types.

From the multiplicity of subjects dealt with in but 150 pages or so of reading matter, it is evident that few of them can be treated comprehensively. In the majority of cases the author tells briefly what is done and gives some information how it is done. But one method is given as a rule, however, for doing any particular thing and in practically all cases the methods given are those of the Royal Dock Yards in England. The information given bears internal evidence of accuracy and brings together probably more information than has ever before been made public in one place as to the details of construction and fittings in English man-of-war practice.

The treatment of the various subjects varies a good deal in clearness and completeness. Thus we gather from the text that the present English practice as regards the deck covering of battleships is practically the same as in the United States Navy, namely, for weather decks the steel deck plating is covered with wooden planking and for decks not exposed to weather "corticine" is used, being apparently what is known as linoleum in this country. The French were probably the first nation to adopt linoleum or something of this nature as a deck covering; the United States used it from practically the beginning of battleship construction, whereas in England it has been used for a few years only. The author gives the conventional description of methods of fitting wooden deck covering, but as to the corticine, the following on page 57 is all that he gives:

> The back of the corticine is covered with knotting, and along the edges galvanized strips 1 inch wide are worked, which are secured to the plating by metal screws (see p. 55), the plating under the corticine being first thoroughly cleaned and coated with an adhesive mixture of resin and tallow.

This can hardly be regarded as an adequate treatment of a question which is really of much importance.

The eleven pages, 91 to 102, devoted to launching arrangements, cover the subject concisely, but with surprising fullness, and it is possible to gather from them very satisfactory knowledge not only of what is done in launching a big English battleship, but how it is done and the reasons for the various operations.

The large portion of the book devoted to the description of the fittings on British battleships is particularly valuable and interesting for reference for those who have to do with such work. Here and there are found items of information which it is believed have not heretofore been published. This applies, it is believed, to the plan showing the type of rudder now used on large English vessels, which appears to give more information as to details than has hitherto been made public.

An annoying feature in connection with the use of this book as a reference book is the absence of chapters and the unsystematic arrangement of subjects. This is made worse by the fact that the index can hardly be regarded as adequate. Thus, on page 57 there is described the use of corticine on decks, as already quoted. There is no reference to corticine in the index. On page 203, under bridges, there is some information given about the chart house, an important fitting, but "chart house" is not indexed.

On page 81 the author says: "In ships intended for ramming, chocks have t[illegible] fitted to the boilers," and on page 82 he i[illegible]rates the ramming chock intended to prev[illegible] the boiler sliding fore and aft off of its sea[illegible] in case of ramming.

If a large modern vessel were d[illegible]n at full speed head-on into a stone wall, the [illegible]ock would not be sufficient to displace a wood[illegible] box setting on the deck, much less a boi[illegible] bolted to bearers. Ramming chocks on such [illegible]essels are simply a survival from former time[illegible]

The illustrations in this book are [illegible]y numerous, taking up about half of the [illegible]ge space. Where several figures are placed [illegible] one page they are distinguished by numbers [illegible]r letters. Otherwise the figures are not num[illegible]ed, reference to them in the text is entire[illegible] by page numbers, which is simple and satisf[illegible]tory.

While the drawings are necessarily [illegible]n a small scale, they are as a rule excellent, [illegible]eing clear and surprisingly comprehensive. The text is written simply and clearly, although very condensed in places.

The book is remarkably free from typographical errors. On page 277 there is a paragraph on testing derricks which apparently has strayed from page 278 or 279.

This work covers a field of its own in that it is restricted to the English man-of-war and primarily the battleship. As a brief description of the principal operations to be performed in building such a vessel and of the principal fittings, etc., installed upon her by the naval constructor in England, this is an excellent work and well worthy of study by those interested in the subject.

Martin's Mechanics Continued.

Reviewed by AMASA TROWBRIDGE.*

TEXT-BOOK OF MECHANICS.—By Louis A. Martin, Jr., Professor of Mechanics, Stevens Institute of Technology. Vol. III: Mechanics of Materials. New York: John Wiley & Sons. London: Chapman & Hall, Ltd. Cloth; 5 × 7½ ins.; pp. 229; 111 text figures. $1.50, net.

Rarely does an author confine himself to writing a text-book only, when his subject permits of a treatise. This is just what Prof. Martin has done. He has prepared a book for the use of students and it is not one which would commend itself to the busy engineer as a reference work.

The scheme of the book is to give an outline of the method of procedure in each article but to require the student to work out the various rules and formulas as exercises. This is certainly beneficial in that it prevents the student from learning by rote and develops his reasoning power while fixing the knowledge of the formula and its deduction firmly in his mind.

The book is quite limited in its scope but the methods pursued by the author in deducing formulas are very general and very thorough. He uses the calculus freely and treats of elementary sections or fibers and hence deduces formulas as rational and complete as possible for physical materials. The book covers sufficient ground for a text-book, although the consideration of curved bars, flat plates and beams composed of materials differing in strength (concrete, reinforced) is not included. Subjects, such as riveted joints, coming properly under the head of applied mechanics, are also omitted. References are given to other works which may be consulted for more extended or advanced treatments.

The main divisions of the volume, in their order, are: Simple Stresses; Stresses in Beams; Deflection of Beams Due to Simple Bending; Statically Indeterminate Beams; Struts and Columns; Torsion; Stress, Strain and Elastic Failure; Compound Stresses and The Principle of Work as Used in Computing Deflections. The book concludes with about forty problems for review and the answers to the problems are also given.

This is the third volume of a series. Volume I., on Statics, was reviewed in these pages July 12, 1906. A review of Volume II., on Kinematics and Kinetics, appeared Dec. 12, 1907. Subjects treated in either of the earlier volumes are not included in this one.

*Naval Constructor, U. S. N., Quarters R., Navy Yard, Washington, D. C.

*c/o The Veeder Manufacturing Co., Hartford, Conn.

A Manual for British Municipal Engineers.

A MANUAL OF CIVIL ENGINEERING PRACTICE—Specially Arranged for the Use of Municipal and County Engineers. By F. Noel Taylor, C. E., M. Inst., M. E. London: Charles Griffin & Co., Ltd. Philadelphia: J. B. Lippincott Co. Cloth; 6 x 9 ins.; pp. 809; 1,179 text illustrations, including 35 folding plates. $7.50, net.

The day has long passed when any one man can comprise in his knowledge and experience all the many details of the practice of civil engineering, even though he have that rare combination of disposition and ability which would lead him to write a book recording the present state of that practice. Beginning with Rankine's monumental work, we have in English only a very few books which might be fairly termed cyclopaedic in their treatment of civil engineering, and of late the impression has gained ground that it is better to have a library of separate books, each by a master of his own field, rather than a collection of short treatises by one man, bound in a more-or-less unwieldly manner between two covers. As a sort of compromise between the Rankine idea and the more condensed pocket-book idea exemplified by Trautwine, we had last year the well-known "American Civil Engineers' Pocket-Book" (see Supplement for Feb. 16, 1911). This approached Rankine in that it was a manual of all branches of civil engineering practice, but it was much superior to Rankine in that each subject was written by specialists and that it was typographically made up into a handy size. It seems, therefore, to be rather a late day for an imitation of the Rankine style of writing. However, this is just what Mr. Taylor's book is. It does not attempt to be a manual of all civil engineering practice, but takes up merely that branch of civil engineering which in England is known as municipal engineering, a field much broader in its scope than the similarly-termed branch in this country. For instance, in his preface Mr. Taylor states that the book

> deals with the general practice of municipal engineering work and the theoretical principles involved therein, and includes such subjects as Design of Structures in brick, stone, and reinforced concrete; Chimneys, Steel Construction and Mechanical Engineering; Roads, Electric Tramways, Bridges, River Work and Land Drainage; Hydraulics and Pumping Machinery; Waterworks and Sources of Supply; Sewage Disposal, Filtration and Purification; Sanitation, House Drainage and Disinfection; Refuse Disposal; also Specification.

All this takes some 807 pages and requires the use of 1,179 illustrations. The author hopes that it will be valuable to young men about to enter the "municipal engineering field" and will aid them materially in passing the examinations which are required in England for entrance into that field.

Obviously it is impossible to give a detailed review of so extensive a work. The author could not have had experience sufficient to give him authority on all the subjects he treats, and for this reason many of his statements are very apparently second hand. His style unfortunately is so rambling as to add to the necessarily great length of his treatise. On the whole, we suppose that the young municipal engineer in England may find in the book a satisfactory substitute for an extensive library if he is so limited in his funds or his space as to be unable to purchase separate books for such a library. For purposes of reference, however, or even of study, a library of various books by different authors will surely serve his purpose much better.

After looking over Mr. Taylor's book, we are again impressed with the difference between the British and the American technical language. Page after page of this book contain terms which have never seen the light of day in an American book and which would be so much Greek to the American engineer if brought to his notice apart from the immediate context. In many places this peculiarity of language is so great as to make the particular references absolutely useless for American engineers. This, of course, is not the fault of the author, who probably never intended his book for any but British engineers. It reflects, however, somewhat on whoever has proposed the book for American circulation.

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Revolving Vectors Applied to Alternating-Current Phenomena.

Reviewed by CHARLES S. SLICHTER.*

REVOLVING VECTORS.—With Special Application to Alternating Current Phenomena. By George W. Patterson, S. B., Ph. D., Professor of Electrical Engineering, University of Michigan; M. Am. Inst. E. E.; M. Am. Ph. Soc., Etc. New York: The Macmillan Co. London: Macmillan & Co., Ltd. Cloth; 5½ × 8½ ins.; pp. 89; 23 text figures. $1, net.

This ninety-page book is intended to serve as an introduction to the use of complex numbers, by the Steinmetz method, in alternating-current problems. The writer's purpose is to give an outline treatment of the theory of complex numbers and of the possibility of their use as the algebraic representatives of vectors, sufficient for a working course, without much attention to a systematic arrangement or development of the fundamental material. The book relies chiefly upon bringing the mechanism of the processes home to the student by the treatment of alternating-current problems of real importance; there is no serious attempt to clear up the fundamental theory of vectors and complex numbers, except as the brighter students may see somewhat deeper than their mathematical equipment justifies. It is the sort of working course, careless of general principles, that our junior and senior undergraduates may readily follow. In this respect the book undoubtedly fills an actual need; other books of a similar type upon other fundamental material omitted in the undergraduate courses in mathematics would be of use; for example to students of thermodynamics, of "strength of materials," etc.

While commending this admirable and useful book, one cannot help regretting that American technical education has not advanced far enough to warrant more thorough and more systematic training in the necessary fundamental theory. Where shall the more ambitious of our students—I mean those who are ambitious to advance to new ideas and to new standards—get their training and equipment in fundamental theory? Certainly not by drill in the mechanism of processes that merely enables them stumblingly to understand what has been done by others in the past. Some students, somewhere, somehow, must be given more than routine equipment—the lack of provision for these students both in our courses of studies and in our prepared texts is deplorable. This need is not at all attempted to be met by the present text on "Revolving Vectors." In that respect, it marks no progress and deserves no praise.

In examining a book like the present, which undertakes to explain the application of the theorem of the product of two vectors (or of two complex numbers) to physical problems, one turns at once to this interesting discussion. The difficulties are real and not easily met when one considers the stage of advancement of the students and the narrow way in which the vector theory is developed for the particular need of alternating-current problems. The broader vision that comes from a course in general vector analysis and its application to dynamics is really necessary to make the matter clear. In the present book the author attempts to distinguish between the vector use and the "harmonic" use of complex numbers. As important as this distinction is, it is doubtful if the student will not find misleading the statements that accompany its introduction. For example: "It must always be had in mind that only the real part of the complex expression is to be considered seriously. The other part is to be looked upon as a scaffolding about a building in process of erection, or the sawdust in a box of torpedoes, which need not be confused with the building or the torpedoes themselves,respectively, for the imaginary symbol is a warning that the associated term is to be disregarded." Such statements, the reviewer believes, are not only inaccurate, but they tend to confuse the student and to blind his eyes. If the student ever proceeds to the study of vector analysis, he will be amazed to find that the "vector" and "scalar" parts of a product are mere distinctions of a sort of *independence*, and that if, for example, he deals with a conservative system in general dynamics, a scalar product may be constant and express the conservation of energy of the system, while a vector product (the sawdust around the torpedoes!) will be independently constant and express the conservation of the angular momenta.

Cramp and Smith in their text on "Vectors and Vector Diagrams applied to the A. C. Circuit," attempt to avoid the same "difficulties" by emphasizing the distinction between complex numbers and vectors. Their explanations in Chapter VIII. seem quite successful for instructional purposes. But better than any of these are the frank words of Steinmetz, who, while empirically stating the facts, leaves room for the imagination and the advancement of the student:

> In multiplication, division and other algebraic operations with the representations of physical quantities by mathematical symbols, *whether ordinary numbers or general numbers*, it is necessary to consider whether the result of the algebraic operation, for instance, the product of two factors, *has a physical meaning*, and, if it has a physical meaning, *whether this meaning is such that the product can be represented in the same diagram as the factors.*

I have supplied the italics. This, it seems to me, is exactly what should be said.

If the students of electrical engineering would study only so much as fifty pages of Abraham's and Föppl's Maxwell Theory, they would have much less difficulty in understanding A. C. vector problems and vector diagrams, and they would obtain a real comprehension of the processes they are employing.

*Professor of Applied Mathematics, University of Wisconsin, Madison, Wis.

THE PUBLIC HEALTH SERVICE DIRECTORY AND YEAR BOOK, 1911.—Compiled by the Editor of "The Medical Officer." London: Hodgetts, Ltd., 36 Whitefriars St., E. C. Cloth; 10 × 6 ins.; pp. 374. 7s. 6d., net; American price, $3.

That so large a volume, mostly in small, closely-leaded type, should be devoted to the purpose indicated by the foregoing title is a testimonial to the health service of Great Britain and to the enterprise of the editor and the publishers of this directory. The directory gives the population and area of the various local government areas of England, Scotland and Wales, together with the names of the medical officers of health, sanitary inspectors, public analysts, veterinary inspectors and various minor officials in the health service. For the smaller places, of course, the list of officers is less extensive than just indicated. Often, but not always, the salaries of the various officials are given. The educational authorities for the three countries are given in the same general way.

The two directories just named constitute only a part of the contents of the volume. There are also alphabetically arranged "personal" directories for each of the leading classes of health officers, on a sort of "Who's Who?" plan. These directories give not only the address and official position of the various persons listed, but also their college or university degrees, certificates held as results of various examinations, titles of books, papers, etc.

The powers and duties of the various classes of officials are outlined; directories of the various national and local health societies are included; a public health calendar, covering a whole year and giving the dates of various meetings, is included. Of particular interest is a list of some twenty universities which confer degrees or grant diplomas in public health, accompanied by the conditions necessary to secure the right to affix D. P. H. after one's name.

Results of spirit leveling in California, Idaho, Montana, Nevada and Utah, are the subjects of Bulletins No. 481, 487, 482, 488 and 489, of the U. S. Geological Survey. The bulletins were prepared by Mr. R. B. Marshall, Chief Geographer, and in general cover the period 1896 to 1910, some being for a period a year or two shorter.

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A Reference Text On Electric Traction.

Reviewed by C. L. DE MURALT.*

ELECTRIC TRACTION FOR RAILWAY TRAINS. —A Book for Students, Electrical and Mechanical Engineers, Superintendents of Motive Power and Others Interested in the Development of Electric Traction for Railway Train Service. By Edward P. Burch, Consulting Engineer, Mem. N. Y. R. R. Club; M. Am. Inst. E. E.; Lecturer on Electric Railways, University of Minnesota. New York and London: McGraw-Hill Book Co. Cloth; 6 × 9½ ins.; pp. 583; 183 text figures. $5, net.

A second good book on electric traction has just come from the press. Appearing so shortly after Sheldon's book on the same subject†—and this subject of such great interst at the present moment—is to be wondered at if comparisons between the two books will be drawn.

From the start it may be said that the two books can stand comparison. As far as general contents and care used in their preparation goes, they are both on a par and belong in the first rank among technical books.

It would seem that Sheldon, in writing his book, had in mind principally the production of a text-book for students, while Burch seems to have addressed his work principally to the practicing engineer as a book of reference. Of course, the two purposes overlap. Sheldon's book will doubtless prove of great value to the practicing man as well, and it is easily conceivable that Burch's book could be used as a text in university work. Nevertheless, there is a great difference in the method employed by the two writers in the treatment of their subject, and the reason for this difference is readily apparent if we consider the purposes which they evidently had in mind while writing.

Sheldon, having in view the requirements of the student, or the needs of the average educated man who wishes to get a general understanding of the electric traction problem, has given us a broad analytical treatment of the matter, bringing out the essentials very clearly and presenting them in such a manner that almost any intelligent reader will be able to grasp the subject readily. But Sheldon does not give us all the minor details. He evidently considers them as harmful to his general program and fears that their inclusion would interfere with a ready understanding of the problem as a whole.

Burch, on the other hand, addressing an audience already trained in the fundamentals of such matters, deals with his subject exhaustively, neglects the educational feature to a large extent, but furnishes us instead with a wealth of details truly astonishing. Even in the opening chapter, which gives a historical review of electrification from the beginnings to this date, there is a profusion of data of great value and tables of statistics which it must have taken considerable time to collect and which are now presented in very handy form for future reference.

Then comes two very interesting chapters on the characteristics of modern steam locomotives and on the advantages of electric traction for trains. The objections to the latter and the obstacles in the way of electrification are also mentioned.

Chapters IV. and V. cover a discussion of the electric systems available for traction and a description of the most typical of electric railway motors. The contents of these two chapters must be used with great care. Sheldon's book treats this subject strictly objectively. Burch seems to have a strong leaning toward one particular kind of motor and he lets his feeling run away with him. He deals with the matter subjectively. The form in which he has presented it and his conclusions will not be approved by all engineers. Besides, these chapters contain some actual inaccuracies.

Chapters VI. to X. contain descriptions of various types of motor cars and electric locomotives actually constructed and of their operating characteristics, also a large number of statistical tables. Chapters XI. to XIII. relate to the power required by electric trains, to the

*Professor of Electrical Engineering, University of Michigan, Ann Arbor, Mich.

†"Electric Traction and Transmission Engineering." Reviewed in Eng. News Literature Supplement, Oct. 12, 1911.

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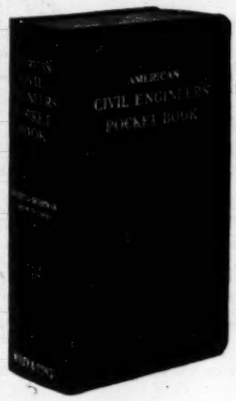

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London: Chapman & Hall, Lim.
Montreal, Can.: Renouf Pub. Co.

power plants which produce this power, and to the transmission and contact lines which carry it from the power plant to the trains.

Then follows a short but interesting chapter giving reasons for electrification and approximate costs. Some comparisons of characteristics of different equipments which are contained in this chapter under the heading "cost of electrification" are not in accordance with actual facts. Some suggestions given under the heading "errors to be avoided" are excellent.

The book concludes with a chapter which gives a good idea of the work already done in railroad electrification by means of a series of tables and technical data concerning completed lines.

All through the book and at the end of each chapter are numerous bibliographical references, which in themselves form a mine of information. In short, it is a fine reference work, if we bear in mind the few inaccuracies noted, and it is a book which will doubtless be appreciated by everyone who has to solve electric-traction problems.

The Fundamental Theories of Framed Structures.

Reviewed by F. C. KUNZ,* M. Am. Soc. C. E.

THE THEORY OF STRUCTURES.—By Charles M. Spofford, S. B., M. Am. Soc. C. E.; Hayward Professor of Civil Engineering, Massachusetts Institute of Technology. New York and London: McGraw-Hill Book Co. Cloth; 6 × 9½ ins.; pp. 411; 315 text figures. $4, net.

The principal contents of this book are the fundamental theories upon which the design of framed structures is based, and their application is illustrated by numerous examples. The theories are those in common use and, with the exception of the continuous beam, this volume treats only of statically determinate structures, the subject of statically indeterminate structures being reserved for another volume.

For the purpose for which this book is intended it is a valuable addition to the already existing works on framed structures, particularly for the student to whom a thorough understanding of the principles and fundamental theories is more important than the design of complete structures.

Chapter I. treats mainly of the external forces (weights, live-loads, wind pressure, etc.). A short space is given to the subject of permissible unit stresses. It is true that this subject concerns principally the practicing engineer, but its importance cannot be too early and strongly impressed upon the student who, as a rule, accepts the specified permissible unit stresses as universally established values, without considering that they were assumed with due regard to the character and probable frequency of the load.

In Chapter II. the principal laws of statics, shears and moments (particularly for beams with fixed loads) are treated in a general way; their application by the student is greatly facilitated by the given examples. This chapter also contains a treatise on influence lines, which are frequently applied in subsequent chapters; this is valuable, as the student who is familiar with the use of influence lines will be better equipped for the solution of static problems since the influence lines give him a clear insight into the effect of different loads.

Chapter III. is devoted exclusively to the calculation of shears and moments in simple beams due to moving concentrated loads. Chapters IV. and V. contain the design of beams and plate girders, considerable space being given to the subject of riveted connections, rivet pitch, splices and other details.

In Chapters VI. and VII. the various methods of calculating the stresses in ordinary trusses are given and illustrated by many well selected examples. The analytical method is almost exclusively used. The graphical method is applied only to roof trusses in the form of Maxwell diagrams; its application to the calculation of stresses in bridge trusses may be often of advantage, especially for trusses with polygonal chords.

*Consulting Engineer, Wissahickon, Philadelphia, Pa.

High Masonry Dam Design

By CHARLES E. MORRISON, C. E., Ph. D., Assoc. M. Am. Soc. C. E., formerly Instructor in Civil Engineering at Columbia University, N. Y. City, and ORRIN L. BRODIE, C. E., Assoc. M. Am. Soc. C. E., Asst. Designing Engineer, N. Y. Board of Water Supply.

"A thorough analysis of masonry dam sections from the standpoint of conservative economy, including a full discussion of *uplift* caused by water penetrating the mass of the masonry and the *horizontal ice thrust* acting at the water surface." (From review by Mr. F. C. Finckle, Eng. News of June 16, 1910, p. 70.)

Formulas for design and for investigation, including above features, are arranged for easy reference and use.

Contains an appendix that outlines the late investigations undertaken for determining more accurately the variations of stress in masonry dams.

8vo, iv+103 pages, 19 figures. Cloth, $1.50 net.

JOHN WILEY & SONS

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London: CHAPMAN & HALL, Ltd. Montreal, Can.: RENOUF PUB. CO.

Chapter VIII. contains the calculation of stresses with multiple web systems, lateral and sway bracing and viaduct towers. Chapters IX. and X. contain the principles of cantilever and three-hinged arch-design, sufficient to convey to the student a general idea of these subjects. Chapters XI. and XII. give in a clear and concise form the principles which govern the design of individual members, such as columns, tension members and their connections.

Chapter XIII. contains a general exposition of graphic statics and their application to the calculation of moments and shears in simple beams and is evidently prepared to make the student familiar with the fundamental principles. The author gives preference to analytical methods on the ground that they are usually shorter and more accurate. This is true in ordinary cases, but sufficiently accurate results can be obtained by graphical methods and for the more complicated cases in a shorter and clearer way than by analytical methods. The designer should be equally acquainted with both methods and be able to judge when he can use the one or the other to advantage.

Chapter XIV. gives both the analytical (method of least work) and the graphical (Williot) method of calculating deflections in simple spans. Finally, Chapter XV. shows the calculation of continuous beams and, in a concise form, its application to the determination of reactions of swing spans.

PROCEEDINGS, CONFERENCE ON MILK PROBLEMS UNDER THE AUSPICES OF THE NEW YORK MILK COMMITTEE, Dec. 2-3, 1910. Published by the Committee, 105 East 22d St., New York City. Paper 6 × 9 ins.; pp. 200. Price, $1.

The attention now being given to the sanitary and economic phases of the public milk supply is evidenced in part by this report. The Conference program was under four main headings: Milk Economics, The Public Milk Supplies and the Public Health, Milk Standards and Milk Commissions. Prof. Wm. T. Sedgwick, of the Massachusetts Institute of Technology, considered milk supplies and their relation to public health, and made an address entitled "The Milk Problem in America To-Day."

WORKMEN'S INSURANCE AND COMPENSATION SYSTEMS IN EUROPE. Annual Report of the Commissioner of Labor, 1909. Vol. II.—Great Britain, Italy, Norway, Russia, Spain and Sweden. Washington, D. C.: Pub. Doc. (Dept. Commerce and Labor). Cloth; 6 × 9 ins.; pp. 1,495-2,749.

The earlier volume of this review covered Austria, Belgium, Denmark, France and Germany, and was noted on page 44 of this Supplement for March 16, 1911. The present volume gives 300 pages to Italy; 230 to Russia; 200 to Great Britain, and to the other countries 50 to 70 pages each, all the figures being approximate. A transcript of the laws in a large number of foreign countries, both European and otherwise, occupies 300 pages at the back of the volume.

A STUDY OF THE BLAST FURNACE.—By Harbison-Walker Refractories Co., Pittsburgh, Pa. Flexible leather; 4 × 6¾ ins.; pp. 163; one map in pocket of cover and many text figures. Gratis.

An introductory note informs us that this book was prepared to familiarize the members of the organization of the Harbison-Walker Refractories Co. with the principles of blast-furnace construction and operation and that it is merely a simple and brief digest of information that has appeared in the technical press. We venture to say, however, that many of our readers would find it a valuable and instructive handbook. Its convenient size and leather binding make the book particularly attractive.

STATISTICAL RECORD OF THE PROGRESS OF THE UNITED STATES, 1800-1911.—And Monetary, Commercial and Financial Statistics of Principal Countries. [From Statistical Abstract of the United States.] Washington, D. C.: Pub. Doc. Paper; 6 × 9 ins.; pp. 86.

National and international statistics of broad general interest are here presented in convenient form. As a matter of curiosity, and not as an illustration of the value of the pamphlet, it may be noted that the per capita amount of money in circulation in 1911 was 2 cts. greater than in 1910, but as the 1911 figures are subject to revision no one should accept these figures as positive evidence of his own increase in wealth without careful individual checking.

HENDRICKS' COMMERCIAL REGISTER OF THE UNITED STATES FOR BUYERS AND SELLERS.—Especially Devoted to the Interests of the Architectural, Mechanical, Engineering, Contracting, Electrical, Railroad, Iron, Steel, Hardware, Mining, Mill, Quarrying, Exporting and Kindred Industries. Twentieth annual edition. New York: Samuel E. Hendricks Co. Cloth; 7½ × 10½ ins.; pp. 1,420. $10, net.

The 20th annual edition of this well-known directory contains more than one-third of a million names and addresses and some 37,000 business classifications. References to manufacturers of almost every conceivable article are given under an alphabetically arranged classification.

CHEMICAL AND BIOLOGICAL SURVEY OF THE WATERS OF ILLINOIS.—University of Illinois Bulletin No. 23. Report for 1909-10; Edward Bartow, Director. Urbana, Ill.: The University. Paper; 6 × 9 ins.; pp. 145; illustrated. 75 cts.

Besides a brief general review of the routine analytical work and the experimental work of the Survey during the past two years, and an outline of the history, objects and work of the Lake Michigan Water Commission and the Illinois Water Supply Commission, this Bulletin presents an account of a number of special studies made in the laboratory of the Survey. These studies deal with the water of Lake Michigan, water treatment with bleaching powder and for softening purposes, water-supplies and typhoid fever in Illinois, etc. A list of apparatus and supplies for a water-works laboratory is given.

STEEL AND REINFORCED CONCRETE IN BUILDINGS.—By Edward Godfrey, M. Am. Soc. C. E.; Structural Engineer for Robert W. Hunt & Co., Author of "Structural Engineering" Books I., II. and III., etc., etc. Pittsburgh, Pa.: The Author (400 Monongahela Bank Bldg.) Flexible morocco; 4½ × 6¾ ins.; pp. 143; 16 plates and many text illustrations. $2, net.

It is the practice of many architects and builders to undertake a certain amount of structural design without the original or subsequent aid of a competent structural engineer. While this practice can hardly be approved by the engineering profession, since it is apt to result in improper construction and perhaps in failure, it nevertheless exists and for that reason anything that will tend to ameliorate its evils should be appreciated by the profession. It is for such a purpose that Mr. Godfrey's little book is designed. It contains short and concise rules for the design of all structural parts of a building in stone, wood and concrete, beginning at the foundations and taking up the various component parts of the structure in order under the following chapter heads: Foundations, footings, column bases, columns and other compression members, lintels, beams, girders, trusses, floor arches and slabs, structural details and estimating loads. The theory of these rules is rarely given, but the methods stated are explained by numerous typical examples and their solution simplified by many designing tables.

INSTRUCTIONS FOR EXPERIMENTS IN LABORATORY FOR TESTING MATERIALS, PURDUE UNIVERSITY. By W. Kendrick Hatt, Professor of Civil Engineering and Director of Laboratory for Testing Materials, and H. H. Scofield, Assistant Professor in Laboratory for Testing Materials. Lafayette, Ind.: The Authors. Paper; 5½ × 8¼ ins.; pp. 72; illustrated. Gratis.

In order to save the instructor from much routine work in the direction of the students in testing materials, particularly in the laboratory work of this course, the authors have prepared this manual of instructions. It is prefaced by some general instructions in the science of testing, but is made up chiefly of specific directions for each of the prescribed experiments. It should be examined with interest by all professors engaged in this line of instruction.

AERIAL LOCOMOTION.—By E. H. Harper, M. A., and Allan Ferguson, B. Sc., with an Introduction by G. H. Bryan, Sc. D., F. R. S. Cambridge, England: University Press. New York: G. P. Putnam's Sons. Cloth; 4¾ × 6¾ ins.; pp. 164; frontispiece and 26 text figures. 1s, net; American price, 40 cts., net.

The authors have prepared a pleasing little handbook for the general reader on the principles and practice of aerial flight by means of heavier-than-air machines and dirigible balloons. Novelty in subject matter and treatment were hardly to be expected unless it be considered a novelty to present a simple brief discussion without vivid descriptions or daring prophecies.

Some 90 pages of the book are devoted to aeroplanes, the discussions being grouped under topics like general principles of aerodynamics, propellers and motors, longitudinal and transverse stability, model flyers, and notable types. There is, of course, less to be said about the theory of dirigibles and the segregation of matter in that part of the book does not extend beyond paragraphing.

ELECTRO-ANALYSIS.—By Edgar F. Smith, Blanchard Professor of Chemistry, University of Pennsylvania. Fifth edition, revised and enlarged. Philadelphia, Pa.: P. Blackiston's Son & Co. Stiff morocco; 5 × 7½ ins.; pp. 332; 46 text illustrations. $2.50, net.

The fourth edition of Dr. Smith's able and unique treatise was reviewed in this supplement for Dec. 12, 1907. The prominent features of that edition have been preserved in this and such changes as are seen have been made to present the latest work and to record recent additions to the literature of electrolytic analysis. The pages have been entirely rearranged and every attempt made to have the book perfect. This is characteristic of the author's continued interest, despite his duties as head of a great university, in a field which has been developed largely through his studies. It shows, too, complete cooperation of the publishers.

New McGraw-Hill Books

Published September 21, 1911

Theory of Structures

By CHARLES M. SPOFFORD, S. B., Hayward Professor of Civil Engineering, Massachusetts Institute of Technology.

432 pp., 6 x 9, illus., $4.00 (17s)

For a number of years mimeograph notes of Professor Spofford's lectures have been in great demand among engineers for their reference data. The present volume is a development of these notes into a splendid treatment of the fundamentals.

The book is distinctive, full of detailed information and a very striking and important addition to the literature of structures.

Published October 15, 1911

Framed Structures and Girders

Vol. I.—Stresses. Part I.

By EDGAR MARBURG, C. E., Sc. D., Professor of Civil Engineering, University of Pennsylvania.

540 pp., 6 x 9, $25 illus., $4.00 (17s)

Professor Marburg's book is labeled Vol. I, but it is in itself a unit and a complete treatise on the fundamentals. The book is well described by the sub-title, "Theory and Practice," for it is the interpretation and application of the theory of stresses for practical purposes. It seems likely to become the standard reference work as well as the most widely used text book on the subject.

Published September 14, 1911

Reinforced Concrete

By JOHN P. BROOKS, Director, Clarkson School of Technology.

220 pp., illus., $2.00 (8/6)

A concise treatise, simplifying the methods of analysis and design in reinforced concrete.

The author works out several designs of structures in detail with particular reference to the proper sequence of computation.

The principles of economy in design are set forth and the diagrams in use lead to the proper selection of steel and concrete dimensions.

Published March, 1911

Kinetic Theory of Engineering Structures

By DAVID A. MOLITOR, B. C. E., C. E.

366 pp., 7 x 9, illus., $5.00 (21s)

A complete analysis of the modern subject of "higher structures." It is remarkable for the thoroughness and breadth of its treatment. It has some specially striking features such as the law of virtual work in discussing cases of statically indeterminate structures and in giving methods of figuring elastic deformations.

Published January, 1911

Hydraulic Turbines

By VIKTOR GELPKE and A. H. VAN CLEVE.

300 pp., 7 x 9, illus., $4.00 (17s)

Design and installation are treated thoroughly by two eminent engineers in this book. It has three parts:

1. Penstocks, anchorages, gates, wheelcases, inlets flow, etc. II. Turbine design with particular attention to Francis, Fourneyron, Jonval and Pelton wheels. III. Niagara Falls, Newfoundland and other plants.

First Edition, Corrected, 1910

Water Power Engineering

By DANIEL W. MEAD, Professor of Hydraulics, University of Wisconsin.

803 pp., 6 x 9, illus., $6.00 (25s), net, postpaid

The authority on water power engineering. It considers every phase of the subject from "preliminary investigations" to the completed power plant.

Published September, 1911

Electric Traction for Railway Trains

By EDWARD P. BURCH, E. E., Consulting Engineer, Lecturer in Electrical Engineering, University of Minnesota.

583 pp., illus., $5.00 (21s)

A modern discussion by an expert on the factors, advantages and possibilities of electrification.

The author has investigated every phase of the question and presents important data, comparisons and conclusions.

He covers systems, equipment, types of locomotives, transmission, etc.

Published October, 1911

Electric Railway Engineering

By CHARLES F. HARDING, S. B., Professor of Electrical Engineering, Purdue University.

350 pp., 6 x 9, illus., $3.00

A concise, practical study of the problems of modern electric traction. Professor Harding bases his work on a sound, practical training, supplemented by several years devoted to the development of his course at Purdue University.

Published August, 1911

Engineering Drawing

By THOMAS E. FRENCH, M. E., Professor of Engineering Drawing, Ohio State University.

289 pp., 452 illus., $2.00 (8/6)

A modern book that has supplanted many of the standard texts, though scarcely two months old. It covers engineering drawing fully. It sets a high standard and is of value not only as a text but for men in practice.

Second Edition, January, 1911

Standard Specifications

By JOHN C. OSTRUP, Formerly Professor of Structural Engineering, Stevens Institute of Technology.

99 pp., 6 x 9, illus., $1.00 (4/6)

A book of ten specifications, covering all the important details of construction work. There are specifications for structural steel, timber, concrete, reinforced concrete, etc.

Published September 15, 1911

Power Plant Testing

By JAMES A. MOYER, S. B., A. M., Consulting Engineer, Assistant Professor of Mechanical Engineering, University of Michigan.

432 pp., 270 illus., $4.00 (17/)

A modern book, designed to meet the demand for a condensed reference on experimental engineering.

It gives full, careful descriptions of the best methods for testing **engines, turbines, boilers** and **auxiliary machinery.**

Published September, 1911

Practical Thermodynamics

By FORREST E. CARDULLO, M. E., Prof. of Mech. Eng., New Hampshire College.

414 pp., 200 illus., $3.50 (15/)

A clear treatment of the principles of thermodynamic apparatus. It covers design and operation.

The author presents the subject from the physical standpoint, and uses the minimum of higher mathematics. His treatment is rigorous, modern, complete.

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Money and Prices.

THE PURCHASING POWER OF MONEY.—Its Determination and Relation to Credit, Interest and Crises. By Irving Fisher, Professor of Political Economy in Yale University; Assisted by Harry G. Brown, Instructor in Political Economy in Yale University, New York: The Macmillan Co. Cloth; 5¾ x 8¾ ins.; pp. 505; 20 illustrations in text. $3, net.

The purchasing power of money is a topic of much practical importance to engineers, manufacturers and contractors, because of its relation to prices and to the stability of industry. Yet it is a subject on which most men of this class, as well as business men generally, are the quickest to admit ignorance. The volume before us sheds abundant light on what is to most everyone a mysterious subject.

This is done in clear and simple language, easily followed by those not versed in economics. At the same time, those who feel the need of formulas, diagrams and tables may satisfy their mental appetites by mathematical paragraphs, chapters and appendixes which the less ambitious reader can easily ignore.

Three paragraphs from the Preface will convey an idea of the purpose of the author, the main principles which he advocates and the relation of these principles to the "quantity theory" of money:

> The purpose of this book is to set forth the principles determining the purchasing power of money and to apply those principles to the study of historical changes in that purchasing power, including in particular the recent change in "the cost of living," which has aroused world-wide discussion.
>
> If the principles here advocated are correct, the purchasing power of money—or its reciprocal, the level of prices—depends exclusively on five definite factors: (1) the volume of money in circulation; (2) its velocity of circulation; (3) the volume of bank deposits subject to check; (4) its velocity; and (5) the volume of trade. Each of these five magnitudes is extremely definite, and their relation to the purchasing power of money is definitely expressed by an "equation of exchange." In my opinion, the branch of economics which treats of these five regulators of purchasing power ought to be recognized and ultimately will be recognized as an exact science, capable of precise formulation, demonstration, and statistical verification.
>
> The main contentions of this book are at bottom simply a restatement and amplification of the old "quantity theory" of money. With certain corrections in the usual statements of that theory, it may still be called fundamentally sound. What has long been needed is a candid reexamination and revision of that venerable theory rather than its repudiation.

It is unnecessary to analyze the contents of the book here further than to state that the author discusses at length the various influences which affect the purchasing power of money and the equation of exchange, gives considerable space to index numbers of purchasing power, and concludes his main text with a chapter entitled "The Problem of Making Purchasing Power More Stable." It almost goes without saying that attention is given to monometallism, bimetallism and polymetallism and various forms of paper currency in their relation to the stability of money and of prices of commodities in general.

The most practical suggestion made by the author is that business men generally inform themselves on the underlying principles of money as the mechanism of exchange and, so far as practicable, govern their operations accordingly. This is of relatively immediate availability. Taking a large look ahead, the author tentatively suggests, as an aid to maintaining the stability of the purchasing power of money, a plan which "may one day be found both practicable and advisable," which is "a combination of the tabular standard with the principles of the gold-exchange standard." This tabular standard would be "the index number of general prices," and would be used as a basis for contracts involving deferred payments, thus furnishing or tending to furnish stability in purchasing power, or ensuring that the money received when a debt was paid would buy as large a composite quantity of various supplies as when the money was loaned. The gold-exchange standard mentioned is a system of partial redeemability in gold of money having a less value than gold,

> by which countries, not themselves on a strict gold basis, nevertheless maintain substantial parity with gold through the foreign exchanges. By this system the government or its agent, while not redeeming its currency in gold, redeems it in orders on gold abroad.

All this may seem to be far from the work and thoughts of most of our readers, but it seems fitting to place on record in these columns an occasional book in each of the fields which border or perhaps here and there overlap those dominated by the engineer.

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HISTORY OF BRIDGE ENGINEERING

By HENRY GRATTAN TYRRELL, Evanston, Ill.
Author of Concrete Bridges and Culverts, Mill Buildings, etc. 480 Pages. 330 Illustrations. Price $4.00

"Presents graphically and concisely the story of bridge building achievement. It is invaluable to engineers and designers. Useful for reference, comparison of types, and ultimate selection."—North American, Phila.

"It covers all sorts of bridges from the earliest times to the present day. The book ought to be of great value as a text book in an Engineering course."—Chicago News.

"A very complete work. Helps in giving ideas to the designer. The book is a credit to the author, and a valuable addition to engineering literature."—Canadian Engineer.

"As would be expected from the writer's experience, his work reads well and is interesting from beginning to end."—Railway Gazette, London.

TRAVAUX MARITIMES.—By A. Guiffart, Ingénieur des Ponts et Chaussées. Paris: Octave Doin & Sons (8, Place de l'Odéon). Cloth; 4¾ x 7¼ ins.; pp. 380; 75 text figures. 5 francs; American price, $1.50, net.

The literature of harbors is much more copious in the continental languages than in English, which is rather strange when the ability of the Englishman as a harbor builder is considered. Nevertheless, it is true that whereas in French, German and Italian there are any number of good books on the design and construction of harbor works, in English there is hardly a modern work worthy of consideration. The little book noted above is, therefore, not epoch-making. It is merely a very good review of some of the more monumental treatises, condensed to fit the form of the encyclopedic series of which it is a part. It takes up in order the role of the harbor in transportation, the physical phenomena of the sea and its shore, the action of sea-water on harbor works, the shape and size of ships, the design of dikes, jetties, seawalls, locks, breakwaters, docks and landing cranes, and finally the methods and machines used in harbor dredging.

Numerous reports on state and local taxation are reviewed by Prof. E. R. A. Seligman, Columbia University, in "The American Economic Review" for June, 1911. Reports made during the past four years by special investigating commissions and by permanent commissions are reviewed. Prof. Seligman says that his survey brings out the following prominent facts:

> (1) The dissatisfaction with the general property tax and the recognition of the evils connected with assessment of personalty, have now become well nigh universal.
>
> (2) There is a growing recognition of the weakness of the local assessment of property.
>
> Finally, perhaps the most encouraging results of the last decade have been the increasing attention given to the problem; the great improvement in the character of the commission, both special and permanent; the utilization to an ever increasing degree of the expert and professional economist; and the evident determination on the part of the various commissions to keep abreast of the best thought in other commonwealths.

The American Railway Engineering Association (Monadnock Block, Chicago) has recently issued as a separate bulletin (No. 140) a paper entitled "The Design of Railway Bridge Abutments," which was delivered before that society by Mr. J. H. Prior, Assistant Engineer, Engineering Department, Chicago, Milwaukee & St. Paul Ry. The paper gives the result of an investigation ordered by the Chief Engineer of the railway and made by the author. It gives a remarkably complete exposition of the various types of abutments which have been and are now being used to support railway bridges. The abutments are divided into three general types—stone masonry, plain concrete masonry and reinforced-concrete masonry. The first is divided further into three types—wing-abutments, T-abutments and U-abutments—but is treated in very short space on account of the very few stone masonry abutments which are now being built. Plain concrete abutments are also divided into eight types and the reinforced-concrete into seven types. Each type is described fully by text and drawings and its advantages and defects pointed out. Finally there is an extensive set of diagrams which give all the details of cost, so that the relative desirability of any type of construction under different conditions can be readily ascertained.

THE TECHNICAL ANALYSIS OF BRASS AND THE NON-FERROUS ALLOYS.—By William Benham Price, Chief Chemist Scovill Manufacturing Co., Waterbury, Conn., and Richard K. Meade, director of the Meade Testing Laboratories, Allentown, Pa. New York: John Wiley & Sons. London: Chapman & Hall, Ltd. Cloth; 5 x 7½ ins.; pp. 267; 17 text figures. $2, net.

The authors of this book have collected together much information on non-ferrous alloys in general as a sort of introduction to their description of methods and apparatus for the chemical examination of alloys, to determine aluminum, antimony, arsenic, bismuth, cadmium, copper, iron (in small percentages), lead, magnesium, manganese, nickel, cobalt, phosphorus, silica, sulphur, tin, and zinc.

PRINCIPLES OF ELECTRICAL ENGINEERING.—By Harold Pender, Ph. D., Professor of Theoretical and Applied Electricity, Massachusetts Institute of Technology, Mem. A. I. E. E. New York and London: McGraw-Hill Book Co. Cloth; 6 x 9½ ins.; pp. 438; 138 text figures. $4 net.

The "preliminary edition" of this book issued late in last year and was reviewed in this Supplement for Jan. 17, 1911. At that time the novel and commendable features were pointed out. The present edition seems to have the many errata of the other corrected and there is an expansion of 23%. Some of this addition comes from the problems attached to the end of the several chapters and some is in amplification of text.

On account of the recent decision of the International Electrotechnical Commission (that, in all future discussions involving vector quantities, the diagrams should be built up to measure angle of lag of current, etc., actually behind the compared voltage line, etc., for anti-clockwise direction) it is interesting to note that the author anticipated the decision, so that his book will be generally accepted without further revision.

Publications Received.

ADMINISTRATION OF THE OFFICE OF RECORDER OF COOK COUNTY, ILLINOIS.—Report prepared for the Judges of the Circuit Court by the Chicago Bureau of Public Efficiency, 900 Masonic Temple (Geo. C. Sikes, Secy.) Paper; 6 x 9 ins.; pp. 63; illustrated.

AERIAL NAVIGATION.—A Popular Treatise on the Growth of Air Craft and on Aëronautical Meteorology. By Albert Francis Zahm, A. M., M. E., Ph. D., Secretary of the Aëro Club of Washington; Governor of the Aëro Club of America, etc., etc. New York and London: D. Appleton & Co. Cloth; 5¼ x 8¼ ins.; pp. 497; 32 plates; 58 illustrations in text. $3, net.

AMERICAN CERAMIC SOCIETY.—Transactions, Vol. XIII. Containing Papers and Discussions Read at the Meeting Held at Trenton, N. J., Feb. 14-16, 1911. Columbus, Ohio: The Society (Edward Orton, Jr., Secy.) Paper; 6 x 9 ins.; pp. 837; illustrated.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS.—Transactions, 1910. Vol. III. (J. C. Olsen, Secy., Polytechnic Institute, Brooklyn, N. Y.) New York: D. Van Nostrand Co. Cloth; 6 x 9¼ ins.; pp. 407; two folding plates and many text illustrations. $6, net.

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